

Patent  
Serial No. 09/767,230  
Docket No. 0887-4150US1

**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE**

**Applicant(s):** Andreas H. Hielscher and Alexander Klose

**Serial No.:** 09/767,230                   **Group Art**           3737

**Filed:** January 22, 2001                   **Examiner:** Jung C. William

**For:** Imaging of a Scattering Medium using the Equation of Radiative Transfer

**SUBMISSION UNDER 37 C.F.R. § 1.114**

Mail Stop RCE  
Commissioner for Patents  
P.O. Box 1450  
Alexandria, VA 22313-1450

Sir:

Responsive to the Office Action dated November 14, 2005, this paper is submitted under 37 C.F.R. § 1.114 and is accompanied by a Request for Continued Examination and an Information Disclosure Statement. A Petition and Fee for a (Three Month) Extension of Time (pursuant to 37 C.F.R. § 1.7(a) extending the date for responding until May 15, 2006) is filed herewith, along with the requisite fee. Applicants respectfully request reconsideration in view of the following remarks.

**Remarks/Arguments** begin on page 2 of this paper.

**REMARKS**

Applicants respectfully request reconsideration of this application in view of the following remarks.

***Status Of Application***

Claims 1-60 are pending in the application; claims 1, 28, 29 and 56-60 being in independent form.

***Response To Rejections Under 35 U.S.C. § 102(b):***

Claims 1, 9-15, 19-23, 28, 29, 37-43, 47-51 and 56-60 have been rejected under 35 U.S.C. § 102(b) as being anticipated by Schotland. In rejecting the claims over the arguments in Applicants' April 20, 2005 amendment, the Examiner repeated the prior rejection stating, "Schotland discloses a method and a system for reconstructing an image of a scattering medium comprising [(1)] a source directing energy into the scattering medium at source location on the scattering medium, [(2)] a detector for measuring the energy emitted from the scattering medium at a detector location on the scattering medium, [(3)] an internal properties of the scattering medium, [(4)] means for using an equation of radiative transfer to predict and generate a function of radiative diffusion through the scattering medium, [(5)] means for generating gradient of the objective function, [(6)] means for modifying the properties of the scattering medium based on the gradient of the objective function, and [(7)] means for generating an representation of the internal properties of the scattering medium." The Examiner further stated that Schotland

includes a method where “properties include at least one of scattering coefficient, an absorption coefficient, an anisotropy factor and a scattering phase function”.

Additionally, in response to Applicants’ arguments distinguishing Schotland the Examiner argued as follows:

(1) with regard to Applicants’ argument that Schotland does not disclose the generation of an objective function or generating the gradient of the objective function in the image reconstruction process and that use of the objective function provides a nonlinear update of the optical properties, the Examiner states that "Schotland discloses the nonlinear characteristics of optical property where the optical properties are expressed in function of optical diffusivity (equation 2) where it is clearly nonlinear. In addition, claims 1, 28, 29 and 56-60 do not disclose specific nonlinearity of the optical properties"; and

(2) with regard to Applicants’ argument that Schotland does not disclose modifying the initial guess of the medium's optical properties based on the gradient of the objective function, the Examiner states that "the initial guess of the medium's optical properties based on the gradient of the objective function is disclosed in col. 10, lns. 33-45 where Schotland clearly discloses CW source 620 radiating object 610 with scattering medium where the radiation emanating from object 610 is approximated to measure both modulus and phase."

Applicants' respectfully traverse the Examiner's rejection for the following reasons.

First, as presented in the last response but not addressed by the Examiner, Schotland does not disclose the generation of an objective function or generating the gradient of the objective function. The gradient of the objective function is used for computing an update of an initial guess of optical properties (scattering coefficient, absorption coefficient, anisotropy factor). As discussed further below, not only is there no gradient of the objective function of Schotland, but there is no initial guess to be updated using a gradient of the objective function. Additionally, the gradient of the objective function is computed by means of an adjoint differentiation technique. Schotland lacks any disclosure of adjoint differentiation for calculating the gradient.

Second, contrary to the Examiner's citation to Schotland col. 10, lines 33-45, Schotland does not teach or disclose using an initial guess of the medium's optical properties or modifying an initial guess based on the gradient of the objective function. Schotland col. 10, lines 33-45 refer only to the experimental set-up for performing tomographic light measurements; i.e., the physical act of direct light in to the medium and measuring the light exiting the medium. These physical measurements disclosed in Schotland are different from the initial guess disclosed by Applicants. Additionally, because Schotland does not disclose an initial guess there is also no disclosure of modifying the initial guess.

Applicant respectfully submits that for claims to be anticipated by a reference in terms of 35 U.S.C. §102, every element of the claimed invention must be identically shown in a single reference either expressly or inherently, and arranged as in the claims under review. Since at least the above referenced elements of each of Applicants' claims 1, 28, 29 and 56-60 are not disclosed in Schotland, reconsideration and withdrawal of the rejection is respectfully requested. Additionally, since claims 1, 28, 29 and 56-60 are believed to be allowable, and claims 9-15, 19-23, 37-43 and 47-51 depend from and further limit one of independent claims 1, 28, 29 or 56-60, claims 9-15, 19-23, 37-43 and 47-51 are also believed to be allowable.

**Response To Rejections Under 35 U.S.C. §103(a):**

Claims 2-8, 16-18, 24-27, 30-36, 44-46 and 52-55 have been rejected under 35 U.S.C. §103(a) as being unpatentable over Schotland in view of Sevick-Muraca. Applicants respectfully traverse the rejections, request reconsideration of the claims and argue that the claims are not obvious in further view of Sevick-Muraca for at least the reasons discussed above. Specifically, because claims 1, 28, 29 and 56-60 are believed to be allowable, and claims 2-8, 16-18, 24-27, 30-36, 44-46 and 52-55 all depend from and further limit one of claims 1, 28, 29 and 56-60, claim 2-8, 16-18, 24-27, 30-36, 44-46 and 52-55 are also believed to be allowable.

**CONCLUSION**

Based on the foregoing remarks, it is respectfully submitted that the claims as amended are patentable and in condition for allowance, for which action is earnestly solicited.

**Patent**  
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Prior to this submission, Applicants' had attempted to arrange an interview orally and in writing without success. Applicants believe that an interview may be very helpful for the Examiner's understanding of the technology. Accordingly, if any issues remain, or if the Examiner has any suggestions for expediting allowance of this application, he is respectfully requested to contact the undersigned at the telephone number listed below.

Favorable consideration is respectfully requested.

**Patent**  
Serial No. 09/767,230  
Docket No. 0887-4150US1

**AUTHORIZATION**

The Commissioner is hereby authorized to charge any additional fees which may be required for consideration of this Amendment to Deposit Account No. 13-4500, Order No. 0887-4150US1. A DUPLICATE OF THIS DOCUMENT IS ATTACHED.

In the event that an extension of time is required, or which may be required in addition to that requested in a petition for an extension of time, the Commissioner is requested to grant a petition for that extension of time which is required to make this response timely and is hereby authorized to charge any fee for such an extension of time or credit any overpayment for an extension of time to Deposit Account No. 13-4500, Order No. 0887-4150US1.

Respectfully submitted,  
MORGAN & FINNEGAN, L.L.P.

Dated: May 9, 2006

By:



Tod M. McElgar  
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